09/914585
JC20 Rec'd PCT/PTO 2 9 AUG 2001

METHOD FOR THE PRODUCTION OF THREE-DIMENSIONALLY ARRANGED CONDUCTING AND CONNECTING STRUCTURES FOR VOLUMETRIC AND ENERGY FLOWS

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The present invention relates to a method for producing three-dimensionally arranged conducting and connecting structures for volumetric and energy flows. The volumetric flows may be gaseous, liquid or solid, or may consist of a mixture of said states of aggregation. The energy flows may be of an acoustic, electric, magnetic or electromagnetic nature.

Such volumetric and energy flows are realized at the present time with the help of many different technologies, as a rule. Conductor paths and bond wires are the most frequently employed paths of transportation in the field of microsystem technology. In addition to hollow conductors, glass fibers are used for transporting electromagnetic energies as well. Volumetric flows are realized by way of channels, hoses and pipelines. With increasing miniaturization, it is possible only with great difficulty to still combine such conducting and connecting elements.

The problem is solved by the invention by using a structured, layered build-up. Methods for building up layers are known from the field of microtechnology. DE-PS 44 20

996, for example, describes a method in connection with which a small amount of the light-setting plastic is maintained between two parallel boards due to the surface tension, with at least one of said boards being permeable to electromagnetic waves. The surface of the plastic liquid located below the board that is permeable to electromagnetic waves, is cured, for example by means of a laser beam that is guided across the surface according to a 3-layer model of the structure to be generated. The model is stored in a connected computer. The laser light cures the plastic liquid layer by layer in accordance with the 3D layer model, whereby the spacing of the boards is increased in each step by one layer thickness, so that fresh plastic material can continue to flow into the intermediate space being created between the cured layer and the board solely on account of its surface tension. Structures can be produced in this way with high accuracy in the micrometer range.

Said technology is employed by the invention.

Different light-setting materials are employed by the invention for producing the layers. Such materials may have all kinds of different physical, chemical and biological properties. For example, the materials may be electrically conductive or electrically insulating, and they may have different optical refraction indices. When the materials are exchanged, the layer segments where no setting occurred in

the preceding setting process, are filled with new material, so that in the subsequent setting process, not only the uppermost layer is connected to the one lying directly underneath it, but material of the uppermost layer is connected also to the material of a layer lying underneath the second-last layer. Thus it is possible within the layer sequence to connect a structure with varying material properties from layer to layer. For volumetric transport, these are uncured areas which, following setting and the flushing process, are available as channels. Said channels can be used also as hollow conductors for high frequency application if the walls of the channels are produced from material that has properties suitable for said purpose.

Furthermore, light-conducting structures can be produced with materials with different refractive indices. Such light-conducting structures can be employed in conjunction with light transistors (key word: light switches light) for producing optical integrated circuits.

Conventional integrated circuits (IC's) can be connected to each other in this manner as well because if an IC has been integrated in a cavity underneath the last surface, it is possible to produce via the connections (pads) a channel with conductive material that can then be extended up to another IC, or also to plug connectors that have been produced in this manner.